

From Astrophysics to Nanoscience: Probing Ion Beams with Synchrotron Radiation

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EUV light is a powerful probe of the electronic structure of matter in its various phases. Nearly all of the known matter in the universe exists in the ionized plasma state, and most of our information about the distant universe is carried by photons emitted and absorbed by ions. Ionized particles may be readily produced in a discharge and subsequently accelerated and mass/charge analyzed to form ion beams of a particular species. The ion-photon-beam (IPB) endstation on ALS beamline 10.0.1.2 merges beams of ions with beams of monochromatized EUV light over a common path of 1.4 meters. The absolute yield of photoions or photofragments is measured as a function of the photon beam energy, which is continuously scanned. An electron-cyclotron-resonance (ECR) ion source produces multiply charged ions, permitting systematic studies along ionic sequences and a fine-tuning of the internal electronic structure of atomic, molecular and cluster ions. Sample photoionization data with applications in astrophysics, EUV lithography and nanoscience will be presented.